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(21) International Application Number: PCT/US92/03498 (22) International Filing Date: 28 April 1992 (28.04.92) (30) Priority data: 695,704 3 May 1991 (03.05.91) US (71) Applicant: MEDCHEM PRODUCTS, INC. [US/US]; 232 West Cummings Park, Woburn, MA 01801 (US). (72) Inventors: FERDMAN, Ariel ; 12 Hillside Avenue, Melrose, MA 02176 (US). KUO, Jing-wen ; 23 Spencer Road, #367, Boxboro, MA 01719 (US). MILLER, David ; 9 Francis Street, Brookline, MA 02146 (US). PINSKY, Vladimir ; 10 Lake Shore Terrace, Apt. #4, Brighton, MA 02135 (US). RICHARDS, William, Dana ; 167 Holliston Street, Medway, MA 02053 (US). SWANN, David ; 950 Massachusetts Avenue, Unit 706, Cambridge, MA 02139 (US).			(74) Agents: BOSHAR, Mark, F. et al.; Hale and Dorr, 60 State Street, Boston, MA 02109 (US).  (81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), GR (European patent), HU, IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), NO, SE (European patent).  <b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: METHOD AND DEVICE FOR WOUND CLOSURE			
<p>TO ELECTRIC SOURCE</p> <p>TO VACUUM LINE</p>			
(57) Abstract			
<p>A method of treating a wound site wherein a porous, adhesive backed dressing (20) is utilized. A vacuum and/or heat (30) is applied to the wound site through the dressing so as to draw the tissue adjacent the wound site to the dressing so as to minimize trauma to the wound and increase the adherence of the adhesive.</p>			

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METHOD AND DEVICE FOR WOUND CLOSUREBackground of the Invention

The present invention related to wound closures  
5 and in particular to an improved adhesive wound  
closure and method for applying the same.

In order to promote the healing of flesh wounds  
in humans and animals it is desireable to bring the  
severed surfaces of the wound into close contact  
10 with each other. Heretofore adhesive backed tapes  
such as the so-called "butterfly" bandages have been  
available as wound closures. Such devices, however,  
have two major problems associated with their use.  
The first problem arises from the difficulty in  
15 securing the adhesive to the tissue adjacent a wound  
without aggravating the wound since such dressings  
require that a pressure be applied to the dressing  
and hence to the wound. However, this is somewhat  
self defeating since applying a pressure to the  
20 tissue adjacent the wound tends to further separate  
the severed surfaces rather than draw them together.  
The second problem arises from the difficulty in  
obtaining a good adhesive bond between the dressing  
and the areas surrounding a wound as a result of the  
25 moist environment caused by the fluids excreted at  
the wound site.

Due to the existence of the above problems suturing has remained the preferred procedure for deep wound treatment notwithstanding the relative ease of using adhesive backed dressings in comparison to suturing.

Summary of the Invention

In view of the above, it is the principle object of the present invention to provide an improved method for the treatment of wounds which enables the use of adhesive backed dressings while overcoming the problems associated with the use of such dressings as discussed above.

A further object is to provide a method of improving the flow characteristics of the adhesive of a dressing so as to minimize the contact force needed to obtain a good bond between the dressing and tissue.

A still further object is to provide a device which may be used in connection with the use of adhesive backed dressings in the treatment of wounds in accordance with the method of the present invention.

In accordance with the present invention a porous wound dressing provided with an adhesive backing is utilized. The contact side of the dressing is applied to the wound site and is heated

as a vacuum is applied to the opposite side thereby improving the flow characteristics of the adhesive while drawing the tissue adjacent the wound site into contact with the adhesive. By drawing the tissue into contact with the dressing rather than pressing the dressing onto the wound the tissue adjacent the wound site is brought more closely to its natural state rather than being further separated as would be the case if the dressing were pressed against the wound site. Applying heat to the dressing also tends to drive moisture from the wound site to thereby improve the adherence of the dressing to the tissue at the wound site.

#### Brief Description of the Drawings

In the accompanying drawings:

Fig. 1 is a simplified diagrammatic view of the effect on tissue adjacent a wound site of applying an adhesive backed dressing in accordance with prior art methodology.

Fig. 2 is a view similar to Fig. 1 illustrating the effect of the method of the present invention on the tissue adjacent a wound site.

Fig. 3 is a simplified view of a device which may be utilized in practicing the method of the present invention.

Detailed Description of the Preferred Embodiment

In the typical application of a dressing 10 to a wound 12 a downward force is applied to the dressing so as to cause a bonding between the adhesive 14 on the back of the dressing and the tissue 16 adjacent the wound. As shown in Fig. 1 a result of the downward force applied at the wound site is that the tissue adjacent the wound site flexes downwardly and actually widens the wound gap by separating the tissue further.

In accordance with a first aspect of the present invention a porous adhesive dressing 20 is utilized. The dressing 20 is lightly applied over the wound site and a vacuum is applied to the tissue adjacent the wound gap through the dressing thereby sucking the nonporous tissue adjacent the wound site into close contact and in bonding contact with the adhesive 22 as shown in Fig. 2. As a result of the wound tissue being brought into close contact the healing process is enhanced. To enable the vacuum to be applied through the dressing, the dressing must be porous. Such a porous dressing is disclosed, for example, in U.S. Patent 4,759,354. One such porous dressing is available commercially

from the 3M Corporation under the tradename  
"TRANSPORE."

As the tissue is sucked up against the dressing  
the dressing is preferably heated to between 40° C  
5 and 80° C. This has two effects: firstly the  
application of heat to the dressing decreases the  
viscosity of the adhesive backing and thereby causes  
the adhesive to flow more uniformly and possibly  
into regions where it would not otherwise flow to  
10 improve the bonding with the tissue adjacent the  
wound. In addition, heating the dressing tends to  
dry the wound site and thereby improves the bonding  
between dressing and the tissue. A further benefit  
of applying heat is derived from the generally  
15 soothing effect that the additional warmth has on a  
possibly traumatized patient.

In a successful test of the invention a 2.6mm x  
4.0mm strip of TRANSPORE tape was applied to a  
section of skin and subjected to a vacuum which when  
20 open had a negative air flow of 1 SCFM (standard  
cubic foot per minute) and heated through a range of  
temperatures. Optimum results were obtained when  
the dressing was heated to a temperature of 55° C.  
When the heat and vacuum were both applied to the  
25 dressing the force of adherence was increased by a  
factor of approximately 2.4 as compared with no heat

or vacuum being applied. When only a vacuum was applied to the dressing the adherence was increased by a factor of approximately 1.6. When only heat was applied the adherence appeared to increase with temperature but leveled off at 80° C with an increased adherence factor of 2.3. At 55° C the adherence increased by a factor of 1.8.

Reference is now made to Fig. 3 wherein a device is depicted with which the present invention may be practiced. The device 30 includes a grip 32 supporting both a suction line 34 and a heating rod 36. The heating rod terminates in a plate 38 through which the suction line 34 passes. The suction line is connected to a vacuum pump 40 through a flow meter 42 and control valve 44. Similarly a control element 46, in the form of a rheostat or the like, is provided to control the temperature attained by the heating element 36.

In use the porous dressing is applied over the wound and thereafter the device 30 is slightly passed over the dressing without bearing down on the dressing. The effect of the vacuum is to draw the tissue to the adhesive backing of the dressing rather than the reverse. The applied heat in addition to assisting in the drying of fluids at the wound site and improving the adhesive



characteristics of the adhesive backing has been reported as having a soothing effect thereby possibly minimizing trauma to the patient.

Thus, in accordance with the above, the  
5   aforementioned objectives may effectively be attained.

What is claimed is:

1. A method of treating a wound comprising the steps of:
  - applying a porous, adhesive backed dressing to
  - 5 a wound site; and
  - applying a vacuum to said wound site through said porous dressing to draw the tissue adjacent the wound into bonding contact with said adhesive without depressing said dressing into the wound.
- 10 2. The method in accordance with claim 1 wherein, the step of vacuum application further includes generating said vacuum with a vacuum line which when open has a negative air flow of approximately 1 standard cubic foot per minute or greater.
- 15 3. The method in accordance with claim 1 comprising the further step of applying heat to said dressing to cause said adhesive to flow and to drive moisture from the wound site, and thereby improve bonding contact between said dressing and the tissue without
- 20 depressing said dressing into the wound.
4. The method in accordance with claim 1 wherein said wound is a flesh wound.
5. The method in accordance with claim 3 wherein said step of heat application further includes heating
- 25 said dressing to between 40°C and 80°C.
6. The method in accordance with claim 3 wherein said step of vacuum application is performed simultaneously with said step of heat application.

7. The method in accordance with claim 5 wherein said step of vacuum application is performed simultaneously with said step of heat application.

8. A method of treating a wound comprising the  
5 steps of:  
applying a porous, adhesive backed dressing to a wound site; and  
applying heat to said dressing to cause said  
10 adhesive to flow and to drive moisture from the wound site, and thereby improve bonding contact between said dressing and the tissue without depressing said dressing into the wound.

9. The method in accordance with claim 8 wherein said wound is a flesh wound.

10. The method in accordance with claim 8 wherein  
15 said step of heat application further includes heating said dressing to be between 40°C and 80°C.

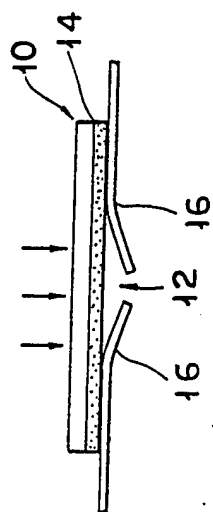
11. A device for use with a porous, adhesive backed  
dressing for treating a wound site, said device  
20 including:  
vacuum means for applying suction to said wound site through said porous dressing to draw the tissue adjacent the wound site into bonding contact with said adhesive without depressing said dressings into the  
25 wound; and  
a grip for supporting said vacuum means.

12. The device in accordance with claim 11 further comprising a plate affixed to said grip means, and said vacuum means passing through said plate.

13. The device in accordance with claim 12 further comprising means for heating said plate so that heat is applied to the dressing to cause said adhesive to flow and to drive moisture from the wound site, and thereby  
5 improve bonding contact between said dressing and the tissue without depressing said dressing into the wound.

14. A device for use with an adhesive backed porous dressing for treating a wound site, said device including:

10           a grip;  
          a plate affixed to said grip; and  
          means for heating said plate so that heat is applied to the dressing to cause said adhesive to flow and to drive moisture from the wound site, and thereby  
15 improve bonding contact between said dressing and the tissue.



PRIOR ART  
FIG. 1

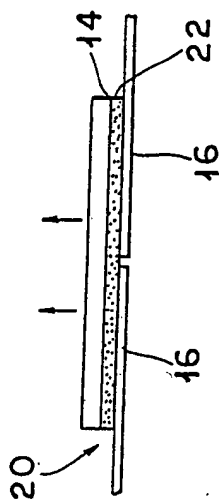


FIG. 2

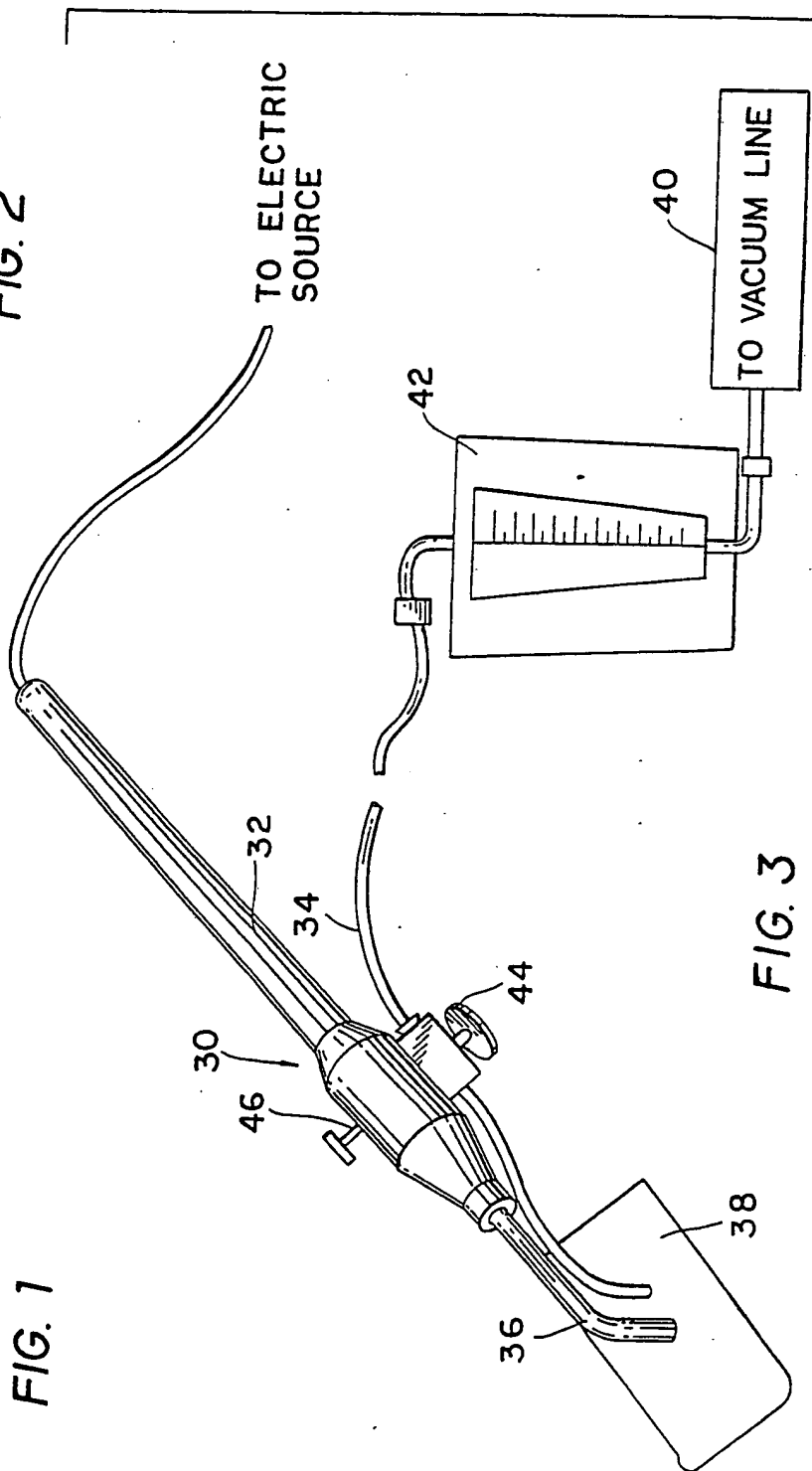


FIG. 3

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US92/03498

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A61M 35/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 4,969,880 (ZAMIEROWSKI) 13 November 1990 See Figure 6	1-14
A	US,A, 4,540,412 (VANOVERLOOP) 10 September 1985 See Figure 1	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

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## B. FIELDS SEARCHED

Minimum documentation searched

Classification System: U.S.

604/290 604: 289-291, 304-305, 307, 313, 315, 316, 902 128: 89.1, 155, 399, 400, 82, 82.1, 851, 390 606: 213, 215,  
216, 27; 138, 148, 149